



SEQUOIA & KINGS CANYON NATIONAL PARKS

& SEQUOIA NATIONAL FOREST/GIANT SEQUOIA NATIONAL MONUMENT

FALL 2007 GUIDE



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Changing climate changes everything

*Hot, cold, moist, and dry, four champions
fierce, strive here for mastery.*

John Milton, Paradise Lost, 1667

The Sierra knows these "four champions" well. From its hot, dry foothills to the frosty peaks, temperature and moisture play a critical role in determining what lives where. In fact, the ups and downs of these climatic conditions affect just about everything everywhere.

Climate has always shifted, but almost always gradually. Over long periods of time, life adjusts very slowly — or adapts — to survive.

Therefore, each creature and plant lives where the specific conditions suit it. Each has a range of hot and cold, wet and dry, that it can tolerate — or that the food it depends on can tolerate. Those that can live with a wide range of conditions inhabit many places (think of common species like coyotes and dandelions). Others are remarkably limited in where they can survive (think of rare life forms like sequoias and cave insects). Climate dictates all.

If climate shifts quickly, life doesn't have time to adapt. Animals and plants cannot change rapidly. A few can migrate, but only if appropriate habitat is close enough. During climate change that is faster than usual, what cannot adapt or move on must perish.

Due to its extreme variety of elevations — and therefore climatic conditions — this park is home to incredibly diverse life. Given that shifting climates could mean big changes to that life, park staff work hard to understand what climate was like in the past and how it could change. They join researchers from other agencies and universities to study a broad



Ancient Sierran ice is melting. Photos of the Darwin Glacier and others document a century of change — and shrinkage. © USGS G.K. Gilbert; © H. Basagic

field of topics related to climate:

- **Snow:** Monthly measurements taken at 29 places throughout the parks reveal snow's depth and water content. This tells approximately how much snowmelt will flow into rivers that support wildlife and feed reservoirs that serve people.
- **Daily weather:** Over a dozen stations record temperature and other weather factors. These documents record highs and lows as well as average changes over time. Temperature affects whether precipitation comes as rain or snow, which affects how much snow accumulates *and* how soon it is melted away by spring rains and heat. It affects how much water evaporates from rivers and reservoirs. In some reptiles, it affects the gender of offspring. For the pika, an alpine cousin of the rabbit, a few degrees too warm spells death. This tiny mammal, already living on mountain peaks, has nowhere to go if the climate heats up.
- **Tree rings:** Weather affects growth, so tree ring patterns tell us about past climate. Long-lived trees like sequoias give us a climate history over thousands of years. We can see when they grew well and when they grew not at all.

• **Fire:** Scars on tree rings also record the number and intensity of past fires. Since we can date tree rings down to season, we know when the fires occurred. Fire intensity and frequency is strongly related to climate. Fire is critical to sequoia reproduction, overall forest health, and creation of habitat for many plants and animals.

Studying these clues to past climate help to predict how upcoming climatic shifts might affect life. What will come to pass if the "fierce champion" of heat increases? Are we willing to accept those changes?